Field Test Program for Long-Term Operation of a COHPAC System for Removing Mercury from Coal-Fired Flue Gas

Quarterly Technical Report
Reporting Period: September 1, 2002 – September 30, 2002

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Submitted: December 26, 2002

DOE Cooperative Agreement No.: DE-FC26-02NT41591

Report No. 41591R01

DISCLAIMER

This technical report was prepared with the support of the U.S. Department of Energy, under Award No. DE-FC26-02NT41591. However, any opinions, findings, conclusions, or recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of the DOE.

ABSTRACT

With the Nation's coal-burning utilities facing the possibility of tighter controls on mercury pollutants, the U.S. Department of Energy is funding projects that could offer power plant operators better ways to reduce these emissions at much lower costs. The National Energy Technology Laboratory (NETL) currently manages the largest research program in the country for developing an understanding of fossil combustion-based mercury emissions, including their measurement, characterization, and the development of cost-effective control technologies for the U.S. coal-fired electric generating industry. One of the goals of the effort is to develop more effective control options in anticipation of upcoming regulations.

Sorbent injection technology represents one of the simplest and most mature approaches to controlling mercury emissions from coal-fired boilers. It involves injecting a solid material such as powdered activated carbon (PAC) into the flue gas. The gas phase mercury in the flue gas contacts the sorbent and attaches to its surface. The sorbent with the mercury attached is then collected by the existing particle control device along with the other solid material, primarily fly ash.

During 2001 ADA Environmental Solutions (ADA-ES) successfully completed the first full-scale demonstration of sorbent-based mercury control technology in the U.S. power industry. The test was performed at the Alabama Power E.C. Gaston Station (Wilsonville, AL). This unit burns a low-sulfur bituminous coal and uses a hot-side electrostatic precipitator (ESP) in combination with a COHPAC baghouse to collect fly ash. The majority of the fly ash is collected in the ESP with the residual being collected in the COHPAC baghouse. PAC was injected between the ESP and COHPAC units to collect the mercury.

Short-term mercury removal levels in excess of 90% were achieved using the COHPAC unit. The test also showed that activated carbon was effective on removing both forms of mercury, elemental and oxidized. Elemental mercury has been proven to be the most difficult form of mercury to capture, and constitutes about 40% of the mercury species at Gaston.

The injection of powdered activated carbon offers a promising approach for mercury control for coal-fired boilers. The injection equipment is relatively inexpensive ($2/kW) and can be installed with minimal downtime of the plant. It is effective for both bituminous and subbituminous coals and when interfaced with a fabric filter it is capable of high levels of mercury removal.

However, a great deal of additional testing is required to further characterize the capabilities and limitations of this technology relative to use with baghouse systems such as COHPAC. It is important to determine performance over an extended period of time to fully assess all operational parameters. As with all other air pollution control technologies, sorbent-based mercury control is a developing technology that needs to go through a phased approach as it matures to become accepted as commercially viable.

The project described in this report focuses on fully demonstrating sorbent injection technology at a coal-fired power generating plant that is equipped with a COHPAC system. The overall

objective is to evaluate the long term effects of sorbent injection on mercury capture and COHPAC performance. The work is being done on ½ of the gas stream at Alabama Power's Plant Gaston Unit 3 (nominally 135 MW). Data from the testing will be used to determine:

1. Is sorbent injection into a high air-to-cloth ratio baghouse a viable, long term approach for mercury control; and
2. Design criteria and costs for new baghouse/sorbent injection systems that will use a similar, polishing baghouse (TOXECON) approach.

A commercial sorbent injection system will be used that will allow for continuous operation with minimal O&M requirements. COHPAC performance will be evaluated using existing diagnostic equipment and with periodic, in-situ fabric drag measurements. Mercury measurements will be made with a dedicated mercury analyzer capable of measuring speciated, vapor phase mercury. Resources are set aside to optimize operation of the mercury analyzers to minimize on-site support. At a minimum, continuous mercury measurements will be made one week per month and during certain test periods. To reduce risk to the host site, a new set of bags will be purchased in case of irreparable degradation to the existing bags. In addition, if new, high-performance fabrics are available, we will work with EPRI and the developers to install and monitor limited numbers of these bags. After performance is optimized with the benchmark sorbent, it will be possible to perform short-term evaluations of up to 3 alternate sorbents.

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There are no graphical materials included in this report.

EXECUTIVE SUMMARY

ADA-ES began work on a Cooperative Agreement with the Department of Energy in September 2002 to fully evaluate PAC injection in conjunction with a high-ratio baghouse for mercury control. The work is being conducted at Alabama Power Company's Plant Gaston. During the two-year, $2.3 million project, a powdered activated carbon injection system will be installed and tested at the plant for a continuous 1-year period of time. ADA-ES is responsible for managing the project including engineering, testing, economic analysis, and information dissemination functions.

As of the first reporting quarter, progress on the project has been made in the following areas:

- Performed preliminary planning and scheduling activities with key program team members, Southern Company, EPRI and NETL.
- Made a decision to use carbon injection equipment from another NETL Cooperative Agreement (DE-FC26-00NT41005) on this program.
- Proposed addition to scope-of-work for bag and installation cost for ½ of Unit 3 COHPAC baghouse.
- Identified potential cost-share participants and action items to make contacts.

INTRODUCTION

Cooperative Agreement No. DE-FC26-02NT41591 was awarded to ADA-ES to demonstrate PAC injection technology on a coal-fired boiler equipped with a COHPAC baghouse. Under the contract, ADA-ES is working in partnership with DOE/NETL, Alabama Power and EPRI.

A detailed topical report will be prepared at the end of the 1-year test period. Quarterly reports will be used to provide project overviews and technology transfer information.

EXPERIMENTAL

No experimental work was performed in the first reporting quarter.

RESULTS AND DISCUSSION

None this reporting period.

CONCLUSION

None this reporting period.

REFERENCES

None this reporting period.

LIST OF ACRONYMS AND ABBREVIATIONS

COHPAC	Compact Hybrid Particulate Collector
DOE	Department of Energy
ESP	Electrostatic Precipitator
kW	Kilo Watts
MW	Mega Watts
NETL	National Energy Technology Laboratory
O&M	Operating and Maintenance
PAC	Powdered Activated Carbon